also given and the probable causes of its local advance and recession discussed. In this connection Mr. Wright emphasized particularly the choking and congestion at the valley outlets, as at the mouth of Glacier Bay and locally at Muir Glacier, and the consequent cutting off of warm tidal currents from the ice front. Under such conditions the ice front advanced rapidly, until later on partial removal of the barrier or sinking of the land, the tidal currents regained access to the ice fronts and inaugurated the present period of rapid recession.

FRED E. WRIGHT,
Secretary

DISCUSSION AND CORRESPONDENCE

DOUBLE-ENDED DRUMSTICKS

TO THE EDITOR OF SCIENCE: The impression was received by more than one person who visited the St. Louis Exposition, that one of the Filipino tribes gathered there used a double-ended drumstick, grasping it in the middle and beating alternately with the ends. Professor O. T. Mason, to whom I applied for light, has most kindly informed me that double-ended drumsticks are occasionally employed to produce variations in sound, the two ends being differently constructed. May I ask if any of the readers of SCIENCE can furnish me with the name of a Filipino or other tribe, who handles a drum-beater as above described? I may add that I am especially desirous of knowing of the existence of any photograph showing such a grasp.

H. NEWELL WARDLE

ARE BULLS EXCITED BY RED?

TO THE EDITOR OF SCIENCE: Is there any real evidence to the effect that bulls are excited by the color red? And how is it with other animals? According to the newspapers, a bull in Sunbury, Pa., charged a window in a millinery store containing an exhibition of red hats and wrecked the store. Is this merely a newspaper myth? X.

NOMENCLATURE OF THE CHIRONOMIDÆ

TO THE EDITOR OF SCIENCE: In 1899 Kieffer proposed *Ceratolophus* (*Bull. Soc. Ent. France,* p. 69) as a new genus of Chironomidæ (Midges) with '*femoratus* (Fabr.)' as type. In 1906 the same author reserved this name (Genera Insectorum. Chironomidæ) for a group not containing the type; he also placed '*femorata* Meig.' in two genera at the same time, viz.: *Palpomyia* (p. 63) and *Serromyia* (p. 65). Further, *Ceratolophus* was preoccupied in 1873 (Bocourt, Reptiles).

It is evident that the nomenclature of certain genera of the Chironomidæ is confused and it is a pity that many authors seem to think that thorough unraveling of the nomenclature is unnecessary, when monographing or revising.

G. W. KIRKALDY

SPECIAL ARTICLES

SPECIFICATION OF DIAGRAMS IN APPLIED GEOMETRY

BY far the greater amount of weariness in reading geometric discussions comes, I think, from the needless labor of searching for and translating the letters describing a figure, into the symbols of the vectors. I have, therefore, been asking myself, whether a few simple rules might not be devised for drawing conventional diagrams, so as to quite eliminate quantities other than those used in the computation. The following plan has assisted me and may be worth remark.

Every vector or arrow is reckoned from a heavy black dot, which I shall call the *but,* to the barb.

When two vectors from the same origin are collinear, the larger vector should step around the barb of the shorter, in the same way in which electrical engineers represent insulated circuits which cross. Conventionally, therefore, a small semicircle, to be called the step-over, is drawn around the arrow point of the shorter vector, *r,* as in Fig. 1.

The barb is generally to be drawn *on one side* only, as in the harpoon, and the letter or specification of the vector placed near the barb and (when necessary for clearness) on the same side of the shaft with the barb and step-over. Where several vectors coincide the line may be thickened.

Right angles should be indicated by an arc joining the line. Other angles marked.

When two coincident vectors have not the same origin, both the but and barb of one vector must be stepped over, as in Fig. 2. Each letter refers to the whole vector between the next but and the next barb in order, on either side of it. Thus in Fig. 2, r'' and r coincide in r'.

When one collinear vector begins where another ends the case is still definite, if the barb and step-over be on the same side of the specification, as stated. Thus in Fig. 3, $r'' = r + r'$. Complications, however, should be avoided.

As an example of this method, Fig. 4 shows the case of the Fresnellian wave surface with two nappes, together with the reciprocal wave surface also with two nappes. The figure shows the following qualities without ambiguity.

The axes of coordinates, x, y, z.

The axes of elasticity a, b, and c, each with its three directions.

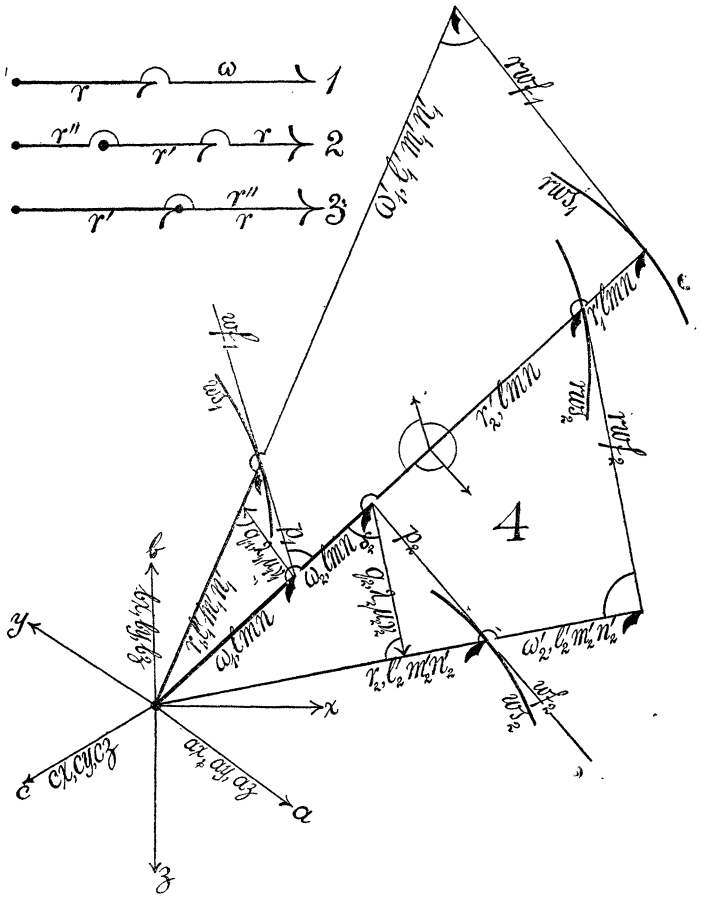
The two wave normals or velocities ω_1 and ω_2 and their direction cosines, l, m, n.

The two wave fronts, wf_1 and wf_2.

The two vectors of the wave surface, or the rays r_1 and r_2, and their direction cosines, l_1', m_1', n_1', and l_2', m_2', n_2'.

The two intersection curves of the wave surfaces ws_1 and ws_2.

The two displacement vectors p_1 and p_2 and their directions, which are the projections of r_1 and r_2 on the respective wave fronts wf_1 and wf_2.



The two force vectors q_1 and q_2, with their direction cosines, λ_1, μ_1, γ_1, and λ_2, μ_2, γ_2.

The two intersection curves rws_1 and rws_2 with the reciprocal wave surface.

The two reciprocal wave fronts rwf_1 and rwf_2.

The two reciprocal wave normals or reciprocal velocities, ω_1', ω_2', and their direction cosines, l_1', m_1', n_1' and l_2', m_2', n_2'.

The two vectors r_1' and r_2' of the reciprocal wave surface and their direction cosines, l, m, n.

All the right angles are indicated and the important angle δ, made by the force vector, is shown in one case.

Clearness is given to the diagram by placing the plane normal to the observer's line of sight. The planes γ_1, ω_1 and ω_2, γ_2 are at right as the auxiliary vectors show.

Naturally the above method is even more pertinent to the modern methods of vector analysis. The diagrams, like the computations, gain in simplicity. And yet it is just here that authors are peculiarly unwilling to fix the ideas of the student to a definite case. Demonstrations in themselves admirably lucid become confused in effect, because the reader is all the while drifting in the haze of the absolute generality of the statement of the premises.

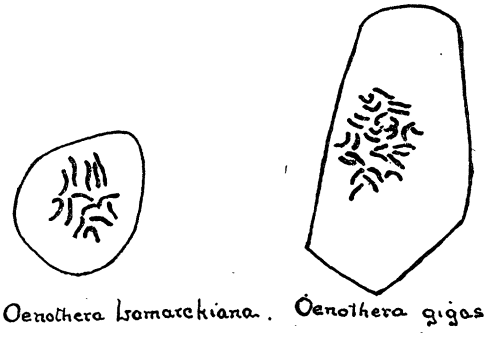
CARL BARUS

A PRELIMINARY NOTE ON THE CHROMOSOMES OF ŒNOTHERA LAMARCKIANA AND ONE OF ITS MUTANTS, O. GIGAS

THE exceptional opportunities offered at this station for a study of inheritance as manifested in the germ cells of the *Œnotheras* led me to undertake a study of the chromosomes of *Œnothera Lamarckiana*, its mutants and hybrids.

The work was begun after the flowering season had passed, however; therefore only somatic cells from the growing root tips of potted plants in the rosette stage have so far been available for study; and it is the purpose of this note, pending the completion of a more general study of the *Œnotheras*, merely to call attention to a most unexpected contrast found in the number of chromosomes of *O. Lamarckiana* and one of its mutants, *O. gigas*, both pure bred.

Because of the smallness of the chromatic figures and the low percentage of figures studied in which the chromosomes could be counted with certainty, I do not at present feel justified in stating the exact number in either form; but I can state unreservedly what is of more interest, that in all the somatic cells of *O. gigas* arising from *O. Lamarckiana* in which the chromosomes could be counted with precision, *the number has become approximately double that of the parental form, O. Lamarckiana.* This result was unexpected, as a somewhat hasty survey of the tips of



several other mutants previous to the study of *gigas* had indicated a number closely approaching or identical with that of the parental form. Gates, in his "Preliminary Note on Pollen Development in *Œnothera lata* de Vries and its Hybrids," published in SCIENCE, February 15, 1907, states that in a cross resulting from the pollination of *O. lata* by *O. Lamarckiana*, "the sporophyte count for the *O. Lamarckiana* side of the cross is at least twenty. The conclusion from this is that pure *O. Lamarckiana* itself must have over twenty chromosomes." In his paper on "Pollen Development in Hybrids of *Œnothera lata* × *O. Lamarckiana*, and its Relation to Mutation,"[1] he adds in a foot-note on page 109: "The inference that *O. Lamarckiana* itself has the same number of chromosomes as the dominant *O. Lamarckiana* hybrid is also apparently not borne out by the facts." From my own observations on all

[1] *Botanical Gazette*, February, 1907.